Pasture Weed Management

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Introduction

Weeds negatively impact pasture quality, productivity, and profitability. They can interfere with forage grasses by competing for resources (i.e., light, space, nutrients, or water) and/or by producing and releasing allelochemicals (Putnam and Weston, 1986) that inhibit growth and development of forages. Weeds reduce the feed value of forage and can be toxic or unpalatable to livestock (Cords, 1973; Dutt et al., 1979; Marten and Anderson, 1975).

Weeds are often categorized according to their life cycle. **Annuals** complete their life cycle within one growing season and propagate by seed. Annuals that are common pasture weeds include common ragweed, annual fleabane, spiny amaranth, buffalo bur, and spotted spurge. **Biennials** complete their life cycle within two growing seasons. Seeds of biennials germinate in the late summer through early fall, over-winter as a rosette, bolt in the late spring through early summer, flower in the summer, produce seed, and then die. Biennials include musk thistle, curly cup gumweed, wild carrot, wild parsnip, common mullein, plumeless thistle, and bull thistle. **Perennials** have the ability to live 3 or more years. **Simple perennials** reproduce only by seed. **Creeping perennials** reproduce by seed and vegetatively from shoots that arise from roots or rhizomes located below-ground. Perennials include western ironweed, western ragweed, Missouri goldenrod, sulphur cinquefoil, leafy spurge, Canada thistle, hoary vervain, hemp dogbane, whorled milkweed, and common yarrow.

Pasture Weed Management Strategies

Weed control in perennial cool-season grass stands should be a component of an overall management strategy that increases the vitality and productivity of the forage stand. Often weed problems are caused by deficiencies of the management strategy being used. Weed problems can result from use of inappropriate grazing management systems, nutrient deficiencies, or poorly adapted forage grasses. Weaknesses in the management practices must be identified before long-term improvement in pasture productivity can be achieved. Management practices that promote the growth and development of forages will hinder weed encroachment and reduce the need for external inputs to control weeds.

Prevention, control, and eradication are three basic weed management strategies. Prevention is probably the most economical and practical way to stop weeds from becoming established. Prevention starts with removing weed seed and vegetative material from farming implements before preparing a seedbed for forage grasses and

planting grass seed that is not contaminated with weed seed. Control is the process of minimizing weed interference with desirable plants. Eradication is the complete elimination of a weed and requires removal of living plants and destruction of seed in the soil.

Weed Control Methods

Biological

Biological control is the use of a living agent to suppress pest populations (Potter 1998). Biological control usually involves any of 3 strategies: conservation; augmentation; and importation of natural enemies (Harley and Forno 1992). Conservation involves manipulation of the environment to enhance the effect of existing natural enemies (biocontrol agents) and is usually used to manage native pests. Augmentation employs periodic release of natural enemies and is restricted to managing pests in high-value food crops because it requires repeated intervention. Importation, also known as ***classical biological control***, is the planned relocation of natural enemies of exotic organisms from their native habitats onto target hosts in their naturalized habitats. This strategy seeks to reestablish pest and natural enemy interactions that reduce the pest population to an acceptable level (DeBach and Rosen 1990). Factors that determine biocontrol agent effectiveness include agent synchrony with the host life cycle, adaptation to new climate and habitats, ability to find the host at varying densities, capacity to reproduce rapidly, and damage inflicted upon the host (Louda and Masters 1993). Biological control agents can also be affected by control methods used against other pests. Examples of invasive weeds which have been the target for biocontrol programs in the U.S. include leafy spurge, musk thistle, and Canada thistle.

Cultural

Cultural practices include fire, grazing, revegetation or reseeding, plant competition, and fertilization. These methods are generally aimed at enhancing desirable vegetation and sustaining vigorous plant communities that resist pest invasion. Proper grazing management coupled with fertilization can improve productivity and competitiveness of the desirable components of the forage stand. Livestock can be used to manipulate pasture and rangeland vegetation by selectively grazing weeds in preference to forage grasses. Planting legumes in mixtures with perennial grasses can improve overall forage quality, yield, and competitiveness with weeds.

Fire, along with climate and herbivory, were the driving forces responsible for the formation and maintenance of most natural grasslands in the world (Wright and Bailey 1982, Pyne 1984). The frequency, intensity, season of occurrence, and interactions with other disturbances influence fire effects on grasslands. Grassland fire regimes were largely shaped by sources of ignition, lightning and humans, and climate (Pyne 1984). Fire is a useful practice to maintain grass dominance by hindering

establishment and expansion of woody plant populations into grasslands (Wright and Bailey 1982).

Most animals have preferences for certain plant species. Selectivity by herbivores alters competitive interactions within natural and artificial grasslands (Crawley 1983, Luken 1990). Appropriate grazing by animals preferring weeds can shift the plant community toward more desired species (Walker 1994). In contrast, excessive cattle grazing without periodic rest can reduce grass competitiveness, shifting the competitive advantage to less palatable weeds (Svejcar and Tausch 1991).

Revegetating grasslands with desirable plants may be the best long-term alternative for managing weeds on sites that lack sufficient abundance of desirable species. Jones and Johnson (1998) described a process that included consideration of site potential, desired landscape, seeding objectives, conflicting land-use philosophies, appropriate plant materials, invasive plants, community seral status, and economic limitations when deciding what plat materials to use in grassland revegetation programs. Herbicides are a critically important component of revegetation programs because they facilitate establishment of planted species by reducing weed interference. Establishing competitive grasses, forbs, and legumes may suppress invasive plants, enhance plant community resistance to further invasion, and improve forage production and quality (Masters and Sheley 2001).

Mechanical

Mechanical treatments involve either removal of the aerial portions of the weed or removal of enough of the root and crown to kill the plant. Annuals and some biennials and perennials can be suppressed or controlled if mowing occurs before fruits mature and viable seeds form. Mowing perennial herbaceous or woody plants that have the capability to reproduce vegetatively can actually increase weed interference by stimulating production of new stems from vegetative buds below the cut surface. Perennial plants that have the capacity to reproduce vegetatively can be severely damaged or killed by tillage, root plowing, or grubbing (Vallentine 1989).

Chemical

The most commonly used herbicides in grasslands are auxin-like growth regulators (phenoxy, benzoic, or picolinic acid herbicides) that selectively control broadleaf plants and do not injure grasses when used at recommended rates. These herbicides serve as a catalyst to rapidly improve grassland quality by selectively altering plant composition and they increase the efficiency with which land managers can meet management objectives (Masters and Sheley 2001). Herbicides are assigned to groups according to their chemistry and mode of action (Ross and Lembi 1999) (Table 1). Mode of action refers to the system, process, or tissue affected by the herbicides. A herbicide is usually selective only within certain rates, environmental conditions, and methods of application. Foliar-active herbicides are applied directly to the leaves or stems of plants where they are absorbed and translocated in the plant. For control of established weeds, including perennial plants, herbicides that are translocated within

the plant prevent regrowth. These herbicides may or may not remain active once moved into the soil. Soil-active herbicides can provide control of germinating seed and may also be absorbed by the roots or inhibit root growth of established plants. Herbicides can be categorized as to whether they are applied preplant, preemergence, and postemergence or whether they control annual or perennial plants, grasses or broadleaves, and herbaceous or woody plants.

Plant response to herbicide treatment is typically dependent on the growth characteristics of the target plant (Sosebee, 1983). Annual plants are best treated with herbicide when actively growing and before changing from the vegetative to reproductive stage. Biennials should be treated when in the rosette stage of development. Simple perennial herbs and non-sprouting woody plants, perennial plants that reproduce solely by seed, are best treated during the late vegetative through flowering stages of development, but before fruit set. Creeping perennial herbs, plants that reproduce both by seed and vegetative means, should be treated after flowering and fruiting are complete or when carbohydrates within storage organs below-ground are being replenished. Herbicide effectiveness declines when vegetative growth ceases and reproduction begins. Sprouting woody plants, arguably the most difficult class of plants to control, should be treated when energy reserves in the roots are being replenished and the herbicide can be translocated below-ground. Refer to Table 2 for recommendations to control selected weeds with Grazon P+D.

Conclusion

Weeds have a negative effect on establishment, yield, and quality of forages. Weed removal or suppression often results in increased productivity of forages as long as the weeds are replaced by the forage and not another weed. Weed control in forage stands should be a component of an overall management strategy that is directed toward increasing the vitality and productivity of the forage stand. Biological, cultural, mechanical, and chemical measures can be used to control weeds on pastures and rangeland. Integration of these control methods in the proper sequence and combination will improve the efficiency and effectiveness of weed management. Weaknesses in pasture and rangeland management strategies must be identified before long-term improvement can be made following weed control. Adjustments in management practices to overcome deficiencies can alleviate the adverse effect of weeds on the yield and quality of forages.

Table 1. Selected herbicides that are currently registered for use on rangeland, pastures, or non-cropland.

Chemical group	Common name	Tradenames	Plants controlled[2]	Activity[3]	Application timing[4]
Benzoic acid	Dicamba	Banvel, Clarity	B	F, S	PRE, POST
Benzonitrile	Bromonynil	Buctril	B	F	POST
Bipyridilium	Paraquat	Gramoxone	B, G	F	POST
Imidazolinone	Imazapic	Plateau	B, G	F, S	PRE, POST
Phenoxy acid	2,4-D	Weedone, 2,4-D LV4, etc.	B	F	POST
	2,4-DB	Butyrac	B	F	POST
	MCPA	Class, MCPA Amine/Ester	B	F	POST
Phenylurea	Tebuthiuron	Spike 20P	B, G	F, S	PRE, POST
Picolinic acid	Clopyralid	Stinger	B	F, S	PRE, POST
	Picloram	Tordon 22K	B	F, S	PRE, POST
	Triclopyr	Remedy, Garlon	B	F	POST
Mixtures	Clopyralid + triclopyr	Redeem R&P	B	F, S	POST
	Picloram + 2,4-D	Grazon P+D	B	F, S	POST
Sulfonylurea	Metsulfuron	Ally, Escort	B, G	F, S	PRE, POST
Unassigned	Glyphosate	Glyphomax, Roundup, etc.	B, G	F	POST

[1]Chemical group and mode of action (Ross and Lembi 1999) and common and chemical names from (Weed Science Society of America 2002).
[2]B = broadleaf & G = grass; [3]F = foliar active & S = soil active; [4]PRE = applied before plant emerges and POST = applied after plant emerges

Table 2. Rate (pints per acre) and timing of application for control of selected weeds with **Grazon P+D**. Use higher rates in range as weeds increase in size.

Weed Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Bitter Sneezeweed					2 pints							
Annual Broomweed						2 pints						
Buffalobur					2 - 4 pints							
Bur Ragweed					2 - 4 pints							
Camphor Weed				2 - 4 pints								
Canada Thistle				4 pints					4 pints			
Carolina Horsenettle					2 pints							
Chicory				2 pints								
Cocklebur				2 pints								
Common Mullein					2 - 4 pints							
Curly Dock				2 - 3 pints								
Goldenrod					2 pints							
Hemlock, Poison/Water				2 pints								
Horseweed					2 pints							
Ironweed					2 - 4 pints							
Knapweed-Biennials					4 pints							
Lambsquarter					2 pints							
Leafy Spurge					4 pints				4 pints			
Locoweeds					4 pints							
Marijuana					2 - 3 pints							
Milkweeds						4 pints						
Prairie Coneflower				2 pints								
Prickly Lettuce				2 pints								
Common Ragweed				2 - 4 pints								
Lanceleaf Ragweed				2 - 4 pints								
Western Ragweed				2 - 4 pints								
Russian Thistle					2 - 4 pints							
Sow Thistle					2 - 4 pints							
Musk & Bull thistles				2 - 4 pints								
Hoary Vervain				2 - 4 pints								
Wild Carrot				2 - 4 pints								

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